

**REMARKS**

Upon entry of this Amendment, claims 20-38 remain pending, with claims 28-38 withdrawn from consideration (with traverse), and claims 20-27 under current examination.

**Regarding the Office Action:**

In the Office Action,<sup>1</sup> the Examiner took the following actions:

- (a) rejected claims 24 and 26 under 35 U.S.C. § 112, second paragraph;
- (b) rejected claims 20-23, 25, and 27<sup>2</sup> under 35 U.S.C. § 102(a) as being anticipated by Wang et al. (U.S. Patent Application Pub. No. 2002/0149838) (“Wang”); and
- (c) rejected claims 24 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Wang in view of Hainberger et al. (U.S. Patent No. 7,054,060) (“Hainberger”).

Applicants traverse the rejections for the following reasons.

**Amendments to the Claims:**

Applicants have amended claims 20, 21, 24, and 26 in part to overcome the 35 U.S.C. § 112, 2nd paragraph, rejection, and in part to more appropriately define the invention. Support for the amendments adding the language “at least” to the claims may be found in the specification, at, for example, page 18, lines 18-30.

**Procedural Issue regarding the Information Disclosure Statement:**

The Examiner did not indicate that he considered all the documents listed under the “Non Patent Literature Documents” on the PTO/SB/08 form filed with the Information Disclosure Statement of January 27, 2005. Applicants therefore request that the Examiner acknowledge consideration of each listed “non patent literature document” by initialing the appropriate portion

<sup>1</sup> The Office Action contains statements characterizing the related art and the claims. Regardless of whether any such statements are specifically identified herein, Applicants decline to automatically subscribe to any statements in the Office Action.

<sup>2</sup> Applicants note that the heading of this rejection did not mention claims 25-27, though they are mentioned within the body of the rejection.

of the form PTO/SB/08 originally filed. Applicants further request that a copy be returned to Applicants' representative with the next communication from the Office.

**Rejection of Claims 24 and 26 under 35 U.S.C. § 112, Second Paragraph:**

The Examiner rejected claims 24 and 26 under 35 under 35 U.S.C. § 112, 2nd paragraph, as being indefinite. In particular, the Examiner alleged that the claimed "group of frequencies" appearing in claims 24 and 26 lacked proper antecedent basis, because base claim 20 recites "group of *pump* frequencies." *See* Office Action, p. 2.

In response, Applicants have amended claims 24 and 26 to recite "...pump frequencies," where appropriate. In addition, Applicants have made similar amendments in claims 20, 28, 32, 34, and 36. Applicants therefore submit that this rejection has been overcome, and respectfully request withdrawal of the rejection.

**Rejection of Claims 20-23, 25, and 27 under 35 U.S.C. § 102(a):**

Applicants request withdrawal of the rejection of claims 20-23, 25, and 27 under 35 U.S.C. § 102(a) as being anticipated by Wang. Applicants again note that the heading of this rejection did not mention claims 25-27, though they are mentioned within the body of the rejection.

In order to properly establish anticipation under 35 U.S.C. § 102, the Federal Circuit has held that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Furthermore, "[t]he identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1126, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). *See also* M.P.E.P. § 2131.

Wang does not disclose each and every element of Applicants' claimed invention, despite the Examiner's allegations. In particular, the Examiner alleges that Wang discloses all the elements of independent claim 20 (*See* Office Action, pp. 3-4), with the exception of the claimed steps of introducing said first and second pump portions into said first and second optical paths being performed such that a residual of said second pump portion entering into said first optical path has a power lower by 10 dB than said first pump portion, and such that a residual of said first pump portion entering into said second optical path has a power lower by 10 dB than said second pump portion... (claim 20).

To support a deficiency in Wang, the Examiner alleges that

[i]t is inherent in the method of operating the optical amplification system of Wang that the residual power of the second pump light entering the first amplifier has a power much lower (10dB or 13dB) than the first pump light entering the first amplifier, and the residual power of the first pump light entering the second amplifier has a [power] much lower (10dB or 13dB) [...] than the second pump light entering the amplifier. This is because the intent is for the gain profiles of the first and second amplifiers to be superimposed, which would not be the case if residual pump light from one amplifier stage were leaking into a different amplifier stage. The difference between the maximum and minimum pump wavelength of each amplifier stage is dependent on the range of signals to be amplified... Office Action, pp. 3-4, emphasis added.

Thus, according to the Examiner, no residual pump light leaks from one amplifier stage into a different amplifier stage of Wang. This position, however, is contradicted by Wang. At paragraph [0036], Wang states that

the gain profile of a particular amplifier group will have contributions from all the amplifiers in that group, i.e., the gain profile of a particular group will be a combination, although not necessarily a linear combination, of the individual gain profiles of the individual amplifiers of a group.

In other words, in its intent to superpose the gain profiles of the amplifiers of a group, Wang does not exclude a possible non-linear combination of the gain profiles. It is observed that

a non-linear combination of the gain profiles of the different amplifier stages could be due to residual pump leaking from one amplifier stage into a different amplifier stage, giving rise to pump-pump interaction between the residual pump leaking from the one amplifier stage and the pump power introduced in the different amplifier stage. This is consistent with one of the objects of Wang, which is to obtain a substantially flat gain profile over a broad range of signal wavelengths. *See, e.g.*, Wang, paragraphs [0012], [0013], [0014], [0037]. Moreover, as explained by Wang at paragraphs [0005] and [0006], for example, in order to obtain a flat profile over a broad range to be achieved, pump-pump interactions are normally contemplated.

Thus, the Examiner is incorrect when he states that a residual pump in Wang necessarily does not leak from one amplifier stage to a different amplifier stage. While it is true that in Wang the residual power of the second pump light entering the first amplifier has a power which is lower than the first pump light entering the first amplifier, and that the residual power of the first pump light entering the second amplifier has a power which is lower than the second pump light entering the second amplifier (due to pump power consumption caused by signal amplification), it is not inherent in Wang that the residual pump power are within the values Applicants have claimed in claim 20 (“at least 10 dB than said first pump portion, and such that a residual of said first pump portion entering into said second optical path has a power lower by at least 10 dB than said second pump portion”) and claim 21 (“at least 13 dB than said first pump portion, and such that a residual of said first pump portion entering into said second optical path has a power lower by at least 13 dB than said second pump portion”). Indeed, no portion of Wang states that “at least 10 dB than said first pump portion, and such that a residual of said first pump portion entering into said second optical path has a power lower by at least 10 dB than said second pump portion,” as recited in independent claim 20.

The Examiner, therefore, if relying on inherency, must provide extrinsic evidence tending to show inherency. “The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.” M.P.E.P. § 2112(IV), internal citations omitted. Thus,

[t]o establish inherency, the extrinsic evidence ‘must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.’ Id.

In this case, the Examiner has not provided extrinsic evidence that makes clear the missing descriptive matter is necessarily present in Wang to satisfy all the elements of independent claim 20. Accordingly, the Examiner’s rejection over Wang on the basis of inherency must fail.

Independent claim 20 is therefore allowable, for at least the reasons argued above, and dependent claims 21-23, 25, and 27 are also allowable at least by virtue of their dependence from allowable base claim 20. Therefore, the 35 U.S.C. § 102(a) rejection of claims 20-23, 25, and 27 should be withdrawn.

**Rejection of Claims 24 and 26 under 35 U.S.C. § 103(a):**

Applicants request reconsideration and withdrawal of the rejection of claims 24 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Wang in view of Hainberger. Applicants respectfully disagree with the Examiner’s arguments and conclusions. A *prima facie* case of obviousness has not been established. As M.P.E.P. § 2142 states, “[t]he examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness.”

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation,

either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). M.P.E.P. § 2142, 8th Ed., Rev. 5 (August 2006), p. 2100-125, 126.

Each of these requirements must "be found in the prior art, and not be based on applicant's disclosure." M.P.E.P. § 2143. A requirement for establishing a *prima facie* case of obviousness is not met, because Wang and Hainberger, taken alone or in combination, do not teach or suggest every element of Applicants' claims.

As discussed, Wang fails to teach each and every element recited in independent claim 20, and required by dependent claims 24 and 26. Hainberger, taken alone or in combination with Wang, does not cure Wang's deficiencies.

For example, the Examiner admitted that Wang does not disclose "that the first and second group of pump frequencies do not overlap each other," and applied Hainberger to "illustrate in Fig. 13, or alternatively in Fig. 31, two non-overlapping groups of pump frequencies..." Office Action, p. 5. In response, Applicants rely on the reasoning presented in the previous section regarding Wang, and point out that Hainberger does not cure Wang's deficiencies as to independent claim 20 or dependent claims 24 and 26, in part because Hainberger does not deal with residual pump power (Hainberger's amplifier has only one stage) and therefore cannot teach each and every element of independent claim 20, which are required by dependent claims 24 and 26.

Moreover, there is no motivation to combine Wang with Hainberger. The Federal Circuit has noted that "virtually all [inventions] are combinations of old elements." *See e.g., In re*

*Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998) (internal citations omitted). The Federal Circuit has explained that an Examiner may find every element of a claimed invention in the prior art, but mere identification is not sufficient to negate patentability. *See Id.* The court explained that “the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.” *Id.*

Also, determinations of obviousness must be supported by evidence on the record. *See In re Zurko*, 258 F.3d 1379, 1386 (Fed. Cir. 2001), 59 USPQ2d 1693, 1696-98 (finding that the factual determinations central to the issue of patentability, including conclusions of obviousness by the Board, must be supported by “substantial evidence”). The desire to combine or modify references must be proved with “substantial evidence” that is a result of a “thorough and searching” factual inquiry. *See In re Lee*, 277 F.3d 1338, 1343-1344 (Fed. Cir. 2002), 61 USPQ2d 1430, 1433 (quoting *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52). Additionally, the Federal Circuit has clearly stated that the evidence of a motivation or suggestion to modify a reference must be “clear and particular.” *In re Dembicziak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999).

In this case, the Office Action does not show that a skilled artisan considering Wang and Hainberger, and not having the benefit of Applicants’ disclosure, would have been motivated to combine the references in a manner resulting in Applicants’ claimed invention. The Examiner has not provided “clear and particular” reasons why a skilled artisan “would select the elements from the cited prior art references for combination in the manner claimed.” *See In re*

*Dembicziak*, 175 F.3d at 999, 50 USPQ2d at 1617; *In re Rouffet*, 149 F.3d at 1357, 47 USPQ2d at 1457.

For example, Hainberger discloses co-propagating and counter-propagating pumps coupled to the same Raman amplifying fiber. Both the co-propagating and the counter-propagating pumps travel within the single amplifying fiber at high power at the same time, so that they can interact with each other and give rise to Four Wave Mixing (FWM). Hainberger teaches (*see, e.g.*, col. 3, lines 40-56) that by an appropriate choice of the propagation direction of the wavelengths of the plurality of pumps, FWM can be reduced.

In contrast to this, in Wang the pumps are introduced in different amplifying fibers. As also admitted by the Examiner, on page 3 of the Office Action, the residual power of a first pump coupled to a first amplifier entering in a second amplifier has a power which is lower than a second pump coupled to the second amplifier. Thus, FWM between the first pump and the second pump could not practically occur in the second amplifier, since FWM power depends on the input power of the interacting signals (*see, e.g.*, Hainberger, col. 2, lines 27-30). Therefore, it follows that Wang does not deal with a problem of possible FWM arising from an interaction between the first and the second pumps in the first or in the second amplifier. Thus, one of ordinary skill in the art would not apply the teachings of Hainberger for improving the amplification system of Wang to produce the elements of Applicants' dependent claims 24 or 26.

Moreover, if the Examiner maintains his position that residual pump light from one amplifier stage does *not* leak into a different amplifier stage (*see* page 4 of the Office Action), it follows that no FWM could occur due an interaction, in one amplifier stage, with a nonexistent residual pump light leaking from a different amplifier stage. Thus, even if the Examiner

maintains his position on the 35 U.S.C. § 102(a) rejection, it follows from his line of reasoning that Wang and Hainberger cannot be combined in this 35 U.S.C. § 103(a) rejection.

In addition, regarding claim 26, at item 8 of the Office Action (page 5), the Examiner relies on the Raman gain profile shown in Fig. 1 of Hainberger to state that “as is evident from the Raman gain profile ..., the first (lower) portion of the optical signal will have a greater attenuation versus wavelength in the Raman amplifying material than the second portion.” In making this statement, the Examiner appears to confuse the Raman gain profile with the attenuation versus wavelength of the Raman amplifying material. The attenuation versus wavelength is a characteristic of a material, which is independent from the Raman gain attitude of the material itself, and corresponds to the attenuation to which each wavelength of a multi-wavelength signal is subjected when the signal propagates in the material (with no amplification). Fig. 1 of Hainberger does not show this, and is not related to the attenuation versus wavelength of the material.

Finally, Hainberger cannot teach anything about a disposition of pump wavelengths in different amplifier stages (as claimed in claim 26), in that the amplifier of Hainberger *has only one stage* (i.e., the co- and counter-propagating pumps are introduced into the same amplifying fiber).

Therefore, the allegations in the Office Action are not properly supported and do not show motivation for one of ordinary skill in the art to combine the references as the Examiner has alleged. The Examiner does not show the alleged motivation to be present in the applied references or in the knowledge available to one of ordinary skill in the art.

In summary, the Examiner has not met his burden of establishing a *prima facie* case of obviousness of at least independent claim 20 over Wang in view of Hainberger. Applicants

therefore submit that independent claim 20 is allowable, as are claims 24 and 26 at least by virtue of their dependence from base claim 20. Accordingly, Applicants request that the 35 U.S.C. § 103(a) rejection be withdrawn.

**Conclusion:**

In view of the foregoing, Applicants request reconsideration of the application and withdrawal of the rejections. Pending claims 20-27 are in condition for allowance. Accordingly, Applicants request a favorable action.

If there are any remaining issues or questions, Applicants request the Examiner telephone the undersigned representative to discuss them.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,  
GARRETT & DUNNER, L.L.P.

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By:

David M. Longo  
Reg. No. 53,235

/direct telephone: (202) 408-4489/